

DETAILED ACTION

Response to Amendment

1. In response to the amendment received November 12, 2009:
 - a. Claims 26-53 were pending. (However, claim 53 is cancelled herein by Examiner's Amendment. See below for full details.)
 - b. The priority issues have been withdrawn in light of the argument. (See below response to arguments for full details).
 - c. The previous 102 rejection has been withdrawn in light of the inclusion of the limitation set forth in the Examiner's Amendment (made below). The previous 103 rejection has been withdrawn in light of resolving the previously set forth priority issue. (See below response to arguments for full details).

Specification

2. It is submitted that there was an error with the substitute abstract and specification received April 17, 2007.

With respect to the abstract:

It appears that the substitute abstract in the pending case (10/529993) received on April 17, 2007 was meant for Application No. 10/530002. The application number on the April 17, 2007 substitute abstract supports that this is the case. In such a manner, the substitute abstract submitted on April 17, 2007 is seen to introduce new matter to the original disclosure (as the instant application is drawn to a membrane with sulfonic acid groups and 10/530002 is drawn towards a membrane with phosphonic acid groups). Accordingly, the substitute abstract submitted April 17, 2007 should not be

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entered. However the correct substitute abstract has been received on January 14, 2010, and it should be entered to rectify the issues set forth above.

With respect to the disclosure:

It appears that the substitute Specification submitted in the pending case (10/529993) received April 17, 2007 was inadvertently mixed with the Specification for Application No. 10/530002. The application numbers on p1 and p2 of the April 17, 2007 substitute Specification supports that this is the case (as p1 notes the pending application, while p2 notes 10/530002). In such a manner, the substitute Specification submitted on April 17, 2007 is seen to introduce new matter to the original disclosure (as the instant application is drawn to a membrane with sulfonic acid groups and 10/530002 is drawn towards a membrane with phosphonic acid groups). Accordingly, the substitute Specification submitted April 17, 2007 should not be entered. However the correct substitute Specification has been received on January 14, 2010, and it should be entered to rectify the issues set forth above.

Response to Arguments

3. Applicant's arguments, see pp 11-17, filed November 12, 2009, with respect to the pending claims have been fully considered and are persuasive. The rejection/objection of claims 26-52/foreign priority has been withdrawn.

With respect to the priority issue:

Applicant argues that WO 2004/024797 (Kiefer et al.), published March 25, 2004 is not applicable as prior art, as the instant application is a 371 Application filed off of International Application PCT/EP2003/009020 (filed October 2, 2003) (a) is not

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applicable as art under 102(e) as it is not published in English and (b) is not applicable under 102(a), as the priority afforded to the instant application is the International Filing date of October 2, 2003.

Examiner would first like to noted that Kiefer et al. was not applied as a prior art with a 102(e), as the WO document was relied upon for the rejection (not the US pre-grant publication), and thus such arguments are irrelevant (as applied to issue (a)). However, with respect to issue (b), Examiner submits that Applicant is afforded priority to the October 2, 2003 international filing date under 371 rules. Accordingly, the objection with respect to the priority has been withdrawn. (Subsequently, the 103 rejection relying on Kiefer et al. is also withdrawn, as Kiefer et al. does not constitute prior art.)

With respect to the prior art issue:

With respect to the previous 103 rejection, as applied to previously pending claim 53 (pertaining to the limitation with respect to the concentration of the “phosphoric acid being from 10 to 80 mols of phosphoric acid per mol of a repeating unit of the polyazole polymer”), the rejection relied upon Kiefer et al. to render obvious such a claim limitation. As set forth above with respect to the priority issues, Kiefer et al. is not applicable as prior art. Accordingly, such a rejection has been withdrawn.

With respect to the previous 102 rejections as applied to independent claims 26, 48, and 51 are now moot in light of the changes to the claim limitations (made by Examiner’s amendment below). The amendment, as set forth below, incorporates the claim limitations of previously pending claim 53 (pertaining to the limitation with respect

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to the concentration of the “phosphoric acid being from 10 to 80 mols of phosphoric acid per mol of a repeating unit of the polyazole polymer”). As set forth above, the rejection of such a limitation previously relied upon Kiefer et al., which is not applicable as prior art. Accordingly, the prior art rejection has been withdrawn. (It is noted that the withdrawal of the rejection with respect to claims 26, 48, and 51, and dependents claims of the preceding independent claims lies in the amendment made by Examiner's amendment and is not an indication that Examiner agrees with the arguments set forth pp 11-15 of the remarks filed November 12, 2009 with respect to the combination of US 2004/0062969 (Sakaguchi et al.) as evidenced by “Polyphosphoric Acid Assay” (Innophos).)

Examiner's Amendment

4. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it **MUST** be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in telephone interviews with Alexander Akhiezer on January 7, 2010 and follow-up correspondences on January 12, 2010, January 14, 2010, and January 19, 2010.

The application has been amended as follows:

a. Amend claim 26 so that it reads (changes underlined for clarity's sake):

A proton-conducting polymer membrane which comprises polyazoles containing sulfonic acid groups and is obtainable by a process comprising the steps:

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A) mixing one or more aromatic or heteroaromatic tetraamino compounds with one or more aromatic or heteroaromatic carboxylic compounds in polyphosphoric acid to form a solution or dispersion, wherein the carboxylic compounds contain at least two carboxylic groups selected from acids, esters, acid halides or acid anhydrides, with at least part of the tetraamino compounds or the carboxylic compounds comprising at least one sulfonic acid group; or

mixing one or more aromatic or heteroaromatic diaminocarboxylic compounds in polyphosphoric acid to form a solution or dispersion, wherein the diaminocarboxylic compounds contain a carboxylic group selected from acids and esters, wherein at least a part of said diaminocarboxylic compounds comprises sulfonic acid groups;

B) heating the solution or dispersion obtained according to step A) under inert gas to temperatures of up to 325°C to form polyazole polymers; and

C) applying a layer using the mixture from step B) to a support, thus forming a membrane on the support; or

D) applying the solution or dispersion from step A) to a support, thus forming a membrane on the support; and

E) heating the membrane formed in step D) under inert gas to temperatures of up to 325°C to form polyazole polymers; and

F) partially hydrolyzing the polyphosphoric acid moieties of the membrane from step C) or step E) until the membrane is self-supporting.

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wherein the concentration of phosphoric acid in the membrane of step (F) is from 10 to 80 mols of phosphoric acid per mol of a repeating unit of the polyazole polymer.

b. Amend claim 48 so that it reads (changes underlined for clarity's sake):

An electrode having a proton-conducting polymer coating which is based on polyazoles and is obtainable by a process comprising the steps:

A) mixing one or more aromatic or heteroaromatic tetraamino compounds with one or more aromatic or heteroaromatic carboxylic compounds in polyphosphoric acid to form a solution or dispersion, wherein the carboxylic compounds contain at least two groups selected from acids, esters, acid halides or acid anhydrides, with at least part of the tetraamino compounds or the carboxylic compounds comprising at least one sulfonic acid group; or

mixing one or more aromatic or heteroaromatic diaminocarboxylic compounds in polyphosphoric acid to form a solution or dispersion, wherein the diaminocarboxylic compounds contain a group selected from acids and esters, wherein at least a part of said diaminocarboxylic compounds comprises sulfonic acid groups;

B) heating the solution or dispersion obtained according to step A) under inert gas to temperatures of up to 350°C to form the polyazole polymer; and

C) applying a layer using the mixture from step B) to an electrode, thus forming a membrane on the electrode; or

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D) applying the solution or dispersion from step A) to an electrode, thus forming a membrane on the electrode; and

E) heating the membrane formed in step D) under inert gas to temperatures of up to 325°C to form polyazole polymers; and

F) partially hydrolyzing the polyphosphoric acid moieties of the electrode membrane formed in step C) or step E),

wherein the concentration of phosphoric acid in the membrane of step (F) is from 10 to 80 mols of phosphoric acid per mol of a repeating unit of the polyazole polymer.

c. Amend claim 51. First delete the last two lines of the claims (the portion that reads “and partially hydrolyzing the polyphosphoric acid moieties of at least one membrane as claimed in Claim 26”). Furthermore, add the following at the end of the claim “wherein the concentration of phosphoric acid in the membrane of step (F) is from 10 to 80 mols of phosphoric acid per mol of a repeating unit of the polyazole polymer.” It is noted that the claim should read as shown below (changes underlined for clarity’s sake):

A membrane-electrode unit comprising at least one electrode having a proton-conducting polymer coating which is based on polyazoles and is prepared by the following steps:

A) mixing one or more aromatic or heteroaromatic tetraamino compounds with one or more aromatic or heteroaromatic carboxylic compounds in polyphosphoric acid to form a solution or dispersion, wherein the carboxylic

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compounds contain at least two groups selected from acids, esters, acid halides or acid anhydrides, with at least part of the tetraamino compounds or the carboxylic compounds comprising at least one sulfonic acid group; or

mixing one or more aromatic or heteroaromatic diaminocarboxylic compounds in polyphosphoric acid to form a solution or dispersion, wherein the diaminocarboxylic compounds contain a group selected from acids and esters, wherein at least a part of said diaminocarboxylic compounds comprises sulfonic acid groups;

B) heating the solution or dispersion obtained according to step A) under inert gas to temperatures of up to 350°C to form the polyazole polymer;

C) applying a layer using the mixture from step B) to an electrode, thus forming a membrane on the electrode; or

D) applying a solution or dispersion from step A) to an electrode, thus forming a membrane on the electrode; and

E) heating the membrane formed in step D) under inert gas to temperatures of up to 325°C to form polyazole polymers; and

F) partially hydrolyzing the polyphosphoric acid moieties of the electrode membrane formed in step C) or step E) until the membrane is self-supporting, wherein the concentration of phosphoric acid in the membrane of step (F) is from 10 to 80 mols of phosphoric acid per mol of a repeating unit of the polyazole polymer.

d. Cancel claim 53.

e. Amend the abstract (received January 14, 2010) such that it reads:

A proton-conducting polymer membrane comprising polyazoles containing sulfonic acid groups is obtainable by a process comprising:

A) mixing one or more aromatic or heteroaromatic tetraamino compounds with one or more aromatic or heteroaromatic carboxylic acids or derivatives thereof which contain at least two acid groups per carboxylic acid monomer, with at least part of the tetraamino compounds or the carboxylic acids comprising at least one sulfonic acid group, or mixing of one or more aromatic or heteroaromatic diaminocarboxylic acids, of which at least part comprises sulfonic acid groups, in polyphosphoric acid to form a solution or dispersion;

B) optionally heating the solution or dispersion obtained by step A) under inert gas to temperatures of up to 325°C to form polyazole polymers;

C) applying a layer using the mixture from step A) or B) to a support, thus forming a membrane, and

D) partially hydrolyzing the polyphosphoric acid moieties of the membrane from step C) until it is self-supporting.

f. Amend the Specification (received January 14, 2010) at p1, line 2 by replacing the word “phosphonic” with the word ‘sulfonic’ (as the instant application is drawn towards membranes with sulfonic acid groups).

Allowable Subject Matter

5. Claims 26-52 are allowable.

6. The following is an examiner’s statement of reasons for allowance:

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None of the prior art of record, alone or in combination, appear to teach, suggest, or render obvious the invention of claims 26, 48, and 51.

Claim 26 teaches the polymer membrane, claim 48 teaches an electrode, and claim 51 teaches a membrane-electrode unit, each comprising the elements recited therein. Notably, all of claims 26, 48, and 51 recite that there is membrane wherein "the concentration of the phosphoric acid...is from 10 to 80 mols of phosphoric acid per mol of repeating unit of the polyazole polymer." None of the applicable prior art of record teach, suggest, or render obvious the use of the disclosed polymer membrane (having a concentration of phosphoric acid from 10 to 80 mols of phosphoric acid per mol of repeating unit of polyazole polymer). The prior art of record (such as Sakaguchi et al.) teach of a polyazole polymer, wherein the polyphosphoric acid is included in the method of preparing, wherein upon polymerization, water is added (thus indicating partial hydrolysis of polyphosphoric acid moieties, as previously set forth in rejections; for example see the rejection set forth in the Office Action dated May 11, 2009) (abs; para 0254-0255). However, there is no indication to the concentration as to the phosphoric acid remaining in the membrane, and thus there is no motivation as to include such a phosphoric acid in the claimed molar amount. Accordingly, none of the prior art of record alone or in combination appear to teach, suggest, or render obvious the invention of claims 26, 48, and 51 (having a concentration of phosphoric acid from 10 to 80 mols of phosphoric acid per mol of repeating unit of polyazole polymer). Since claims 27-47, 49-50, and 52 are dependent on one of claims 26, 48, and 51, they would be allowable for the same reasons.

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Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to EUGENIA WANG whose telephone number is (571)272-4942. The examiner can normally be reached on 7 - 4:30 Mon. - Thurs., EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached on 571-272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/E. W./

Examiner, Art Unit 1795

/Gregg Cantelmo/

Primary Examiner, Art Unit 1795